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## **The impact of terrorism on financial markets: an empirical study**

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**Abstract:** The main focus of this paper is to empirically study the previous impact of terrorism on the behavior of stock, bond and commodity markets. We consider terrorist events that took place in 25 countries over an 11-year time period and implement our analysis using different methods: an event-study approach, a non-parametric methodology, and a filtered GARCH-EVT approach. In addition, we compare the effect of terrorist attacks on financial markets with the impact of other extreme events such as financial crashes and natural catastrophes. The results of our analysis show that a non-parametric approach is the most appropriate method among the three for analyzing the impact of terrorism on financial markets. We demonstrate the robustness of this method when interest rates, equity market integration, spillover and contemporaneous effects are controlled. We show how the results of this approach can be used for investors' portfolio diversification strategies against terrorism risk.

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# The impact of terrorism on financial markets: An empirical study - Supplementary appendix

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<i>N</i>	<i>Date of attack</i>	<i>Country</i>	<i>Type of attack</i>	<i>Target</i>	<i>Killed</i>	<i>Wounded</i>	<i>Other</i>
1	18.07.1994	Argentina	Bombing	Personnel	86	300	
2	22.01.1995	Israel	Bombing	Transport	21	69	
3	19.04.1995	U.S.A	Bombing	Facilities	168		
4	19.11.1995	Pakistan	Suicide bombing	Government	16	60	
5	08.01.1996	Indonesia	Kidnapping	Personnel			26
6	31.01.1996	Sri Lanka/ Colombo	Bombing	Facilities	100	1500	
7	09.02.1996	UK	Bombing	Personnel	6		
8	18.02.1996	UK	Bombing	Transport	1	9	
9	25.02.1996	Israel	Suicide bombing	Transport	26	80	
10	04.03.1996	Israel	Bombing	Facilities	20	75	
11	15.06.1996	UK	Bombing	Facilities		206	
12	02.01.1997	U.S./UK	Bombing	Facilities			
13	23.02.1997	U.S.	Armed Assault	Personnel	1		
14	24.02.1997	Colombia	Kidnapping	Personnel			1
15	13.03.1997	Israel	Armed Assault	Personnel	7	30	
17	17.04.1999	UK	Bombing	Transport	2	30	
18	20.04.1999	India	Bombing	Facilities	5	47	
16	13.09.1999	Russia	Bombing	Facilities	118		
19	22.11.2000	Israel	Bombing	Transport	2	60	
20	01.01.2001	Israel	Bombing	Transport		60	
21	03.01.2001	Switzerland	Bombing	Facilities			
22	25.05.2001	Israel	Bombing	Transport		65	
23	27.05.2001	Israel	Bombing	Personnel			
24	24.07.2001	Sri Lanka/ Colombo	Bombing	Transport	12		
25	11.09.2001	U.S.A	Bombing	Facilities	3000		
26	29.10.2001	Israel	Suicide bombing	Transport	3	9	
27	29.10.2001	Russia	Suicide bombing	Military	3	1	
28	28.10.2001	Pakistan	Armed Assault	Facilities	15		
29	13.12.2001	India	Armed Assault	Government	7		
30	27.01.2002	Israel	Suicide bombing	Personnel	1	100	
31	09.03.2002	Israel	Suicide bombing	Personnel	11	52	
32	17.03.2002	Pakistan	Armed Assault	Facilities	5	46	
33	20.03.2002	Peru	Bombing	Transport	10	38	
34	10.04.2002	India	Armed Assault	Facilities	5	4	
35	10.04.2002	Israel	Suicide bombing	Personnel	8	22	

**Table 1: Terrorism events**

<i>N</i>	<i>Date of attack</i>	<i>Country</i>	<i>Type of attack</i>	<i>Target</i>	<i>Killed</i>	<i>Wounded</i>	<i>Other</i>
36	08.05.2002	Pakistan	Bombing	Transport	12	19	
37	09.05.2002	Russia	Bombing	Personnel	42	150	
38	19.05.2002	Israel	Suicide bombing	Facilities	3	59	
39	14.06.2002	Pakistan	Bombing	Transport	11	51	
40	19.06.2002	Israel	Suicide bombing	Transport	6	43	
41	17.07.2002	Israel	Suicide bombing	Transport	5	38	
42	31.07.2002	Israel	Bombing	Facilities	9	87	
43	04.08.2002	Israel	Bombing	Transport	9	50	
44	05.08.2002	Pakistan	Armed Assault	Facilities	6	1	
45	12.10.2002	Indonesia	Bombing	Transport	202	300	
46	26.12.2002	Philippines	Armed Assault	Transport	13	10	
47	27.12.2002	Russia	Suicide bombing	Government	80	210	
48	19.05.2003	Israel	Suicide bombing	Facilities	3	52	
49	05.08.2003	Indonesia	Bombing	Facilities	10	150	
50	15.11.2003	Turkey	Bombing	Facilities	25	300	
51	15.11.2003	Colombia	Armed Assault	Personnel	1	72	
52	05.12.2003	Russia	Suicide bombing	Transport	42	150	
53	09.12.2003	Russia	Suicide bombing	Facilities	5	14	
54	29.01.2004	Israel	Suicide bombing	Transport	11	30	
55	01.02.2004	Iraq	Suicide bombing	Government	109	200	
56	22.02.2004	Israel	Suicide bombing	Transport	10	62	
57	11.03.2004	Spain	Bombing	Transport	191	1900	
58	09.05.2004	Russia	Bombing	Government	6	56	
59	04.08.2004	Greece	Bombing	Facilities	-	-	
60	22.09.2004	India	Armed Assault	Government		6	
61	22.09.2004	Israel	Suicide bombing	Facilities	2	16	
62	07.10.2004	Egypt	Bombing	Facilities	34	159	
63	24.10.2004	Turkey	Bombing	Facilities		6	
64	15.04.2005	Colombia	Armed Assault	Personnel	4	23	
65	18.04.2005	Russia	Armed Assault	Personnel	2	3	
66	10.05.2005	Russia	Bombing	Military	2	2	
67	10.05.2005	Colombia	Other	-	-	-	
68	23.06.2005	Australia	Other	-	-	-	
69	24.06.2005	Israel	Armed Assault	Facilities	5	12	
70	25.06.2005	Spain	Bombing	Facilities			
71	26.06.2005	Colombia	Armed Assault	Military	25		18
72	07.07.2005	UK	Suicide bombing	Transport	56	700	
73	23.07.2005	Egypt	Bombing	Facilities	88		
74	29.07.2005	Spain	Bombing	Facilities	-	-	
75	15.08.2005	Russia	Bombing	Personnel	1	7	
76	15.08.2005	Egypt	Bombing	Personnel		2	
77	25.08.2005	Russia	Bombing	Government	1	2	

**Table 1 (Cont'd.): Terrorism events**

Category	Index	Number Of Observ.
I. Global, European American and Swiss Stock Markets	FTSE All World	3054
	MSCI Europe	3054
	S&P 500	3051
	SMI	3054
II. Banks and Financials	FTSE Global Banks	2534
	FTSE Global Financials	2534
III. Insurance	MSCI Europe Insurance	2795
	FTSE All World Life Insurance	3054
	FTSE All World Non-Life Insurance	3054
IV. Travel and Airlines	FTSE All World Travel	3054
	MSCI Europe Airlines	2795
V. Defense and Pharmaceutical	FTSE All World Aero/Defense	3054
	FTSE All World Pharma/Biotech	3054
VI. Oil and Gas	FTSE All World Oil/Gas	3054
	FTSE Europe Oil/Gas	3054
VII. Commodity Markets	GSCI Commodity	3054
	GSCI Gold	3054
VIII. Bond Markets	J.P. Morgan Global Government Bond Index	3054
	FTSE Eurozone Bond Index	1925
	FTSE U.S. Government Bond Index	1491

**Table 2: Financial markets indices.** The table shows the list of indices considered in the study and the way they are grouped into eight categories.

	<i>Min.</i>	<i>Max.</i>	<i>Mean</i>	<i>S.D.</i>	<i>Skew.</i>	<i>Kurt.</i>	<i>Jarque-Bera</i>
FTSE All World	-0.0501	0.0466	0.0002	0.0083	-0.17	6.33	1427.59
MSCI Europe	-0.0635	0.0556	0.0002	0.0108	-0.26	6.47	1564.10
S&P 500	-0.0711	0.0557	0.0003	0.0107	-0.11	6.74	1776.40
SMI	-0.0733	0.0746	0.0003	0.0119	-0.15	7.38	2453.86
FTSE Global Banks	-0.0530	0.0707	0.0001	0.0116	0.03	6.14	1040.11
FTSE Global Financials	-0.0515	0.0684	0.0002	0.0115	0.13	5.92	903.20
MSCI Europe Insurance	-0.1287	0.0998	0.0002	0.0160	-0.33	9.58	5085.01
FTSE All World Life Insurance	-0.0618	0.0826	0.0004	0.0123	0.02	6.58	1630.26
FTSE All World Non-Life Insurance	-0.0610	0.0838	0.0003	0.0120	0.12	7.14	2185.27
FTSE All World Travel	-0.1291	0.1279	0.0001	0.0145	-0.23	10.03	6301.54
MSCI Europe Airlines	-0.1525	0.0899	0.0000	0.0157	-0.34	9.86	5711.73
FTSE All World Aero/Defense	-0.0858	0.0535	0.0003	0.0118	-0.47	7.38	2550.24
FTSE All World Pharma/Biotech	-0.0508	0.0595	0.0004	0.0097	-0.11	6.02	1162.56
FTSE All World Oil/Gas	-0.0686	0.0479	0.0004	0.0100	-0.32	6.03	1220.37
FTSE Europe Oil/Gas	-0.0776	0.0634	0.0004	0.0123	-0.16	5.83	1027.65
GSCI Commodity	-0.0915	0.0500	0.0003	0.0122	-0.20	5.25	662.83
GSCI Gold	-0.0508	0.0883	0.0000	0.0082	0.74	13.89	15359.69
J.P. Morgan GGBI	-0.0174	0.0189	0.0000	0.0039	0.06	4.54	301.77
FTSE Eurozone Bond Index	-0.0099	0.0074	0.0000	0.0021	-0.42	4.12	157.17
FTSE U.S. Gov. Bond Index	-0.0156	0.0138	0.0000	0.0031	-0.32	4.35	137.75

**Table 3: Descriptive statistics of daily returns on different indices from January 1994 to August 2005.** The table shows the descriptive statistics for daily returns on the indices. *S.D.* denotes standard deviation. *Skew.* denotes skewness, *Kurt.* denotes kurtosis. Jarque-Bera test (?) is a parametric hypothesis test of normality, equal to a sum of the standardized skewness and kurtosis. In our case Jarque-Bera test indicates that considered log transformed returns are not normally distributed. This is also equivalent to violation of the log-normality assumption of the original returns on index.

<i>N</i>	<i>Date</i>	<i>Natural Catastrophe</i>	<i>Country</i>	<i>Insured Loss (in U.S.D bn)</i>
1	04.01.1994	Northridge Earthquake	U.S.A	17.3
2	17.01.1995	Great Hanshin Earthquake	Japan	3
3	24-25.10.98	Winter Storm Winnie	UK, Netherlands Germany , Switzerland	0.2
4	17.08.1999	Earthquake in Izmit	Turkey	2
5	25.12.1999	Winter Storm Lothar	France, Switzerland et al	6.4
6	13-19.09.00	Typhoon Saomai	Japan, Korea, Russian	0.9
7	05.06.2001	Tropical Storm Alison	U.S.A	3.2
8	02.05.2003	Tornadoes and hail	U.S.A	3.2
9	26.12.2004	Tsunami	South Asia	12
10	01.08.2005	Hurricane Katrina	U.S.A	45

**Table 4: Natural catastrophes**

Index	Impact of Terrorist Events				Impact of Financial Crises				Impact of Natural Catastrophes						
	Event Day	Post-Event Window	Both	Total	Num. Events	Event Day	Post-Event Window	Both	Total	Num. Events	Event Day	Post-Event Window	Both	Total	Num. Events
FTSE All World	19	13	11	43	77	1	0	1	2	4	1	4	0	5	18
	18	1	11	30	77	0	0	1	1	4	2	4	1	7	19
	11	4	8	23	77	2	0	0	2	4	0	1	0	1	19
S&P500	15	13	12	40	77	0	0	1	1	4	1	6	0	7	19
	12	5	8	25	67	1	0	1	2	3	0	1	1	2	17
FTSE Global Banks	14	9	9	32	67	1	0	1	2	3	0	4	0	4	17
FTSE Global Financials	16	8	13	37	75	0	0	1	1	3	1	1	1	3	17
MSCI Europe Insurance	17	9	9	35	77	1	0	1	2	4	1	3	0	4	18
FTSE All World Life Insurance	15	13	8	36	77	1	0	1	2	4	2	2	1	5	18
FTSE All World Non-Life Insurance															
FTSE All World Travel															
MSCI Europe Airlines	8	6	17	31	75	0	0	1	1	3	1	3	0	4	17
FTSE All World Aero/Defense	16	8	5	29	77	2	0	0	2	4	0	6	0	6	18
FTSE All World Pharma/Biotech	8	8	12	28	77	2	0	0	2	4	0	2	0	2	18
FTSE All World Oil/Gas	8	13	5	26	77	1	0	0	1	4	0	1	1	2	18
FTSE Europe Oil/Gas	9	10	1	20	77	1	0	0	1	4	1	3	1	5	18

**Table 5: An event-study approach: Negative effect of terrorist attacks, financial crashes and natural catastrophes on stock markets by type of impact.** The table describes the effect of terrorist events, financial crashes and natural catastrophes on different stock markets. It shows the number of terrorist attacks, financial crashes and natural catastrophes that effected the performance of market indices either on the event-day or in the post-event window as well as in both periods.



Index	Terrorist Attacks				Financial Crashes				Natural Catastrophes			
	<i>Event-Day</i>		<i>Post-Event</i>		<i>Event-Day</i>		<i>Post-Event</i>		<i>Event-Day</i>		<i>Post-Event</i>	
	<i>AR*</i>	<i>AR**/****</i>	<i>CAR*</i>	<i>CAR**/****</i>	<i>AR*</i>	<i>AR**/****</i>	<i>CAR*</i>	<i>CAR**/****</i>	<i>AR*</i>	<i>AR**/****</i>	<i>CAR*</i>	<i>CAR**/****</i>
FTSE All World	15	15	11	13	0	2	0	1	1	0	1	3
MSCI Europe	7	22	2	11	0	1	0	1	0	2	2	3
S&P500	5	14	4	8	0	2	0	0	0	0	0	2
SMI	5	23	11	14	0	1	1	0	0	1	1	5
FTSE Global Banks	7	13	5	8	1	1	1	0	1	0	0	2
FTSE Global Financials	6	17	5	13	0	2	1	0	0	0	1	2
MSCI Europe Insurance	9	20	8	13	0	1	0	1	0	2	0	2
FTSE All World Life Insurance	7	20	7	13	0	2	1	0	1	0	1	2
FTSE All World Non-Life Insurance	11	13	4	17	0	2	0	1	2	1	0	3
FTSE All World Travel	7	12	8	12	0	2	0	0	1	1	2	2
MSCI Europe Airlines	5	20	8	15	0	1	1	0	0	1	1	2
FTSE All World Aero/Defense	5	16	4	9	0	2	0	0	0	0	3	3
FTSE All World Pharma/Biotech	5	15	8	12	0	2	0	0	0	0	0	2
FTSE All World Oil/Gas	3	10	9	9	0	1	0	0	1	0	1	1
FTSE Europe Oil/Gas	0	10	6	5	0	1	0	0	1	1	1	3

**Table 6: An event-study approach: Negative effect of terrorist attacks, financial crashes and natural catastrophes on stock markets by strength of impact.** The table describes the effect of terrorist events, financial crashes and natural catastrophes on stock markets. It shows the strength of the impact of these extreme events. *AR* stands for the abnormal return and *CAR* for cumulative abnormal return. The number of stars next to *AR* and *CAR* indicates their statistical significance level: one star corresponds to 0.10, two stars to 0.05 and three stars to 0.01.

Index	Event Day			Post-Event Window			Terrorist Attacks			Both			Total
	AR*	AR**/****		Total	CAR*	CAR**/****		Total	AR*	AR**/****		Total	
		AR**/****	Total			CAR**/****	Total			CAR**/****	Total		
FTSE All World Aero/Defense	2 (2)	4 (5)	<b>6 (7)</b>	1 (0)	0 (0)	<b>1 (0)</b>	1 (0)	0 (0)	<b>1 (0)</b>	1 (0)	0 (0)	<b>1 (0)</b>	<b>8 (7)</b>
FTSE All World Pharma/Biotech	5 (1)	1 (5)	<b>6 (6)</b>	6 (2)	2 (3)	<b>8 (5)</b>	0 (1)	2 (2)	<b>0 (1)</b>	0 (1)	2 (2)	<b>2 (3)</b>	<b>16 (14)</b>
Financial Crashes													
Event Day	AR*	AR**/****		Total	CAR**/****		Total	AR**/****		Total	CAR**/****		Total
FTSE All World Aero/Defense	0 (0)	0 (0)	<b>0 (0)</b>	0 (0)	0 (0)	<b>0 (0)</b>	0 (0)	0 (0)	<b>0 (0)</b>	0 (0)	0 (0)	<b>0 (0)</b>	<b>0 (0)</b>
FTSE All World Pharma/Biotech	0 (0)	0 (1)	<b>0 (1)</b>	1 (0)	0 (0)	<b>1 (0)</b>	1 (0)	0 (0)	<b>0 (0)</b>	0 (0)	0 (0)	<b>0 (0)</b>	<b>1 (1)</b>
Natural Catastrophes													
Event Day	AR*	AR**/****		Total	CAR**/****		Total	AR**/****		Total	CAR**/****		Total
FTSE All World Aero/Defense	0 (0)	2 (1)	<b>2 (1)</b>	1 (0)	0 (1)	<b>1 (1)</b>	1 (1)	0 (0)	<b>0 (1)</b>	0 (1)	0 (0)	<b>0 (1)</b>	<b>3 (3)</b>
FTSE All World Pharma/Biotech	0 (0)	0 (0)	<b>0 (0)</b>	2 (1)	2 (2)	<b>4 (3)</b>	4 (3)	0 (0)	<b>0 (1)</b>	0 (0)	0 (0)	<b>0 (1)</b>	<b>4 (4)</b>

**Table 7: Event-study and non-parametric approaches: positive impact of terrorist attacks, financial crashes and natural catastrophes on the aero/defense and pharma/biotech sectors: by type and strength of impact.** The table describes the positive impact of different extreme events on aero/defense and pharma/biotech sectors. The values in parentheses correspond to the results of the non-parametric approach.

Index	Event Day			Post-Event Window			Terrorist Attacks			Both			Total
	AR*	AR**/****	Total	CAR*	CAR**/****	Total	AR*	AR**/****	Total	CAR*	CAR**/****		
Financial Crashes													
Event Day			Post-Event Window			Terrorist Attacks			Both			Total	
AR*	AR**/****	Total	CAR*	CAR**/****	Total	AR*	AR**/****	Total	CAR*	CAR**/****			
FTSE All World Oil/Gas	1 (6)	0 (1)	1 (7)	5 (2)	3 (1)	8 (3)	1 (1)	1 (0)	2 (1)	0 (0)	0 (0)	2 (1)	11 (11)
FTSE Europe Oil/Gas	2 (3)	0 (2)	2 (5)	2 (1)	2 (3)	4 (4)	1 (0)	1 (0)	1 (0)	1 (0)	1 (0)	2 (0)	8 (9)
Natural Catastrophes													
Event Day			Post-Event Window			Terrorist Attacks			Both			Total	
AR*	AR**/****	Total	CAR*	CAR**/****	Total	AR*	AR**/****	Total	CAR*	CAR**/****			
FTSE All World Oil/Gas	0 (0)	0 (0)	0 (0)	0 (1)	1 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)
FTSE Europe Oil/Gas	0 (0)	0 (1)	0 (1)	0 (1)	1 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (2)
Financial Crashes													
Event Day			Post-Event Window			Terrorist Attacks			Both			Total	
AR*	AR**/****	Total	CAR*	CAR**/****	Total	AR*	AR**/****	Total	CAR*	CAR**/****			
FTSE All World Oil/Gas	0 (0)	0 (0)	0 (0)	0 (1)	3 (1)	3 (2)	1 (1)	0 (1)	1 (1)	0 (1)	0 (1)	1 (2)	4 (4)
FTSE Europe Oil/Gas	0 (1)	0 (0)	0 (1)	2 (0)	1 (0)	3 (0)	0 (0)	0 (2)	0 (0)	0 (0)	0 (2)	0 (2)	3 (3)

**Table 8: Event-study and non-parametric approaches: positive impact of terrorist attacks, financial crashes and natural catastrophes on the oil and gas sector: by type and strength of impact.** The table describes the positive impact of different extreme events on the oil/gas sector. The values in parentheses correspond to the results of the non-parametric approach.

Index	Event Day	Impact of Terrorist Events			Num. Events	Event Day	Impact of Financial Crises			Num. Events	Event Day	Impact of Natural Catastrophes		
		Post-Event Window	Both	Total			Post-Event Window	Both	Total			Post-Event Window	Both	Total
FTSE All World	24	2	4	30	77	2	0	0	2	4	2	1	0	3
MSCI Europe	24	4	4	32	77	0	0	1	1	4	2	3	0	5
S&P500	18	6	5	29	77	2	0	0	2	4	0	1	0	1
SMI	20	4	9	33	77	1	0	0	1	4	1	2	0	3
FTSE Global Banks	20	1	1	22	66	1	0	0	1	3	0	0	0	0
FTSE Global Financials	20	6	3	29	66	1	0	0	1	3	1	0	0	1
MSCI Europe Insurance	25	5	6	36	73	1	0	0	1	3	2	1	0	3
FTSE All World Life Insurance	23	2	4	29	76	1	0	0	1	4	1	2	0	3
FTSE All World Non-Life Insurance	19	6	5	30	76	1	0	0	1	4	3	1	0	4
FTSE All World Travel	20	4	0	24	76	2	0	0	2	4	0	0	0	0
MSCI Europe Airlines	12	3	9	24	73	1	0	0	1	3	0	0	0	0
FTSE All World Aero/Defense	20	6	1	27	76	2	0	0	2	4	1	3	0	4
FTSE All World Pharma/Biotech	14	2	4	20	76	2	0	0	2	4	0	0	0	0
FTSE All World Oil/Gas	13	11	3	27	76	1	0	0	1	4	0	2	0	2
FTSE Europe Oil/Gas	11	4	2	17	76	1	0	0	1	4	1	2	0	3

**Table 9: A non-parametric approach: Negative effect of terrorist attacks, financial crashes and natural catastrophes on stock markets by type of impact.** The table describes the effect of terrorist events, financial crashes and natural catastrophes on stock markets markets. It shows the number of terrorist attacks, financial crashes and natural catastrophes that effected the performance of market indices either on the event-day or in the post-event window as well as in both periods.

Index	Terrorist Attacks						Financial Crashes						Natural Catastrophes					
	<i>Event-Day</i>			<i>Post-Event</i>			<i>Event-Day</i>			<i>Post-Event</i>			<i>Event-Day</i>			<i>Post-Event</i>		
	Impact		Window		Impact		Impact		Window		Impact		Impact		Window		Impact	
	Abn.	Extr.	Abn.	Extr.	Abn.	Extr.	Abn.	Extr.	Abn.	Extr.	Abn.	Extr.	Abn.	Extr.	Abn.	Extr.	Abn.	Extr.
FTSE All World	9	19	2	4	0	0	2	0	0	0	1	1	0	0	1	0	1	1
MSCI Europe	11	17	4	4	0	0	1	0	1	0	0	2	2	1	0	2	1	1
S&P500	4	19	6	5	0	0	2	0	0	0	0	0	0	1	0	1	0	0
SMI	7	22	5	8	0	0	1	0	0	0	0	1	0	0	1	0	2	2
FTSE Global Banks	10	11	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
FTSE Global Financials	5	19	6	4	0	0	1	0	0	0	0	1	0	0	1	0	0	0
MSCI Europe Insurance	13	18	5	6	0	0	1	0	0	0	0	2	0	0	2	0	1	1
FTSE All World Life Insurance	10	17	2	5	0	0	1	0	0	0	1	0	1	0	1	1	1	1
FTSE All World Non-Life Insurance	6	19	6	5	0	0	1	0	0	0	3	0	0	0	0	1	1	1
FTSE All World Travel	5	15	2	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0
MSCI Europe Airlines	2	19	2	10	0	0	1	0	0	0	0	2	0	0	2	0	2	2
FTSE All World Aero/Defense	7	15	2	5	0	0	2	0	0	0	0	1	2	1	0	2	1	1
FTSE All World Pharma/Biotech	4	15	2	4	0	0	2	0	0	0	0	0	0	0	0	0	0	0
FTSE All World Oil/Gas	4	12	4	10	0	0	1	0	0	0	0	0	0	0	0	0	2	2
FTSE Europe Oil/Gas	5	8	5	1	1	0	0	0	0	0	0	1	0	0	1	0	2	2

**Table 10: A non-parametric approach: Negative effect of terrorist attacks, financial crashes and natural catastrophes on stock markets by strength of impact.** The table describes the effect of terrorist events, financial crashes and natural catastrophes on stock markets. It shows the strength of the impact of these extreme events. *Abn.* stands for abnormal movements in the event-day returns or in the post-event window (conditional probability is in the interval  $(0.05;0.10]$ ). *Extr.* corresponds to extreme index movements (conditional probability is in the interval  $[0.00;0.05]$ ).

Index	Event-Day Impact						Natural Catastrophes		
	Terrorist Attacks			Financial Crashes			Extreme		
	Total	Extreme	Number of Events	Total	Extreme	Number of Events	Total	Extreme	Number of Events
FTSE All World	26	19	76	1	1	4	0	0	18
MSCI Europe	22	16	77	1	1	4	2	1	19
S&P500	22	15	77	2	2	4	0	0	19
SMI	28	15	77	1	1	4	1	1	19
FTSE Global Banks	20	10	69	0	0	2	0	0	17
FTSE Global Financials	21	19	66	2	1	3	0	0	17
MSCI Europe Insurance	28	20	73	1	1	3	2	0	17
FTSE All World Life Insurance	23	11	74	2	2	4	0	0	17
FTSE All World Non-Life Insurance	22	15	75	1	1	3	2	0	16
FTSE All World Travel	19	8	77	2	2	4	0	0	18
MSCI Europe Airlines	23	21	74	1	1	3	2	1	17
FTSE All World Aero/Defense	23	16	76	2	2	4	1	0	18
FTSE All World Pharma/Biotech	15	10	76	2	2	4	0	0	18
FTSE All World Oil/Gas	13	12	62	0	0	2	0	0	15
FTSE Europe Oil/Gas	10	8	62	0	0	2	1	0	15
GSCI Commodity	7	2	77	0	0	4	2	2	19
GSCI Gold	9	7	77	0	0	4	0	0	19
J.P.Morgan GGBI	4	3	77	0	0	4	2	2	19
FTSE Eurozone Bond Index	3	2	60	0	0	1	1	0	14
FTSE U.S. Government Bond Index	3	1	59	0	0	1	0	0	9

**Table 11: A GARCH-EVT approach: Negative effect of terrorist attacks, financial crashes and natural catastrophes on financial**

**markets.** The table describes the effect of terrorist events, financial crashes and natural catastrophes on different financial markets. It shows the number of terrorist attacks, financial crashes and natural catastrophes that effected the performance of market indices on the event-day.

Index	Event-Day Impact								
	Terrorist Attacks			Financial Crashes			Natural Catastrophes		
	Total	Extreme	Number of Events	Total	Extreme	Number of Events	Total	Extreme	Number of Events
FTSE All World Aero/Defense	6	6	76	0	0	4	1	1	18
FTSE All World Pharma/Biotech	9	6	76	1	1	4	0	0	18
FTSE All World Oil/Gas	4	1	62	0	0	2	1	0	15
FTSE Europe Oil/Gas	6	3	62	0	0	2	2	0	15
GSCI Commodity	10	5	77	0	0	4	2	2	19
GSCI Gold	2	2	77	2	1	4	0	0	19
J.P.Morgan GGBI	12	5	77	2	2	4	1	0	19
FTSE Eurozone Bond Index	12	8	60	0	0	1	2	2	14
FTSE U.S. Government Bond Index	7	4	59	0	0	1	0	0	9

**Table 12: A GARCH-EVT approach: Positive effect of terrorist attacks, financial crashes and natural catastrophes on financial**

**markets.** The table describes the positive effect of terrorist events, financial crashes and natural catastrophes on different financial markets. It shows the number of terrorist attacks, financial crashes and natural catastrophes that effected the performance of market indices on the event-day.

Index	Impact of Terrorist Events				Impact of Financial Crises				Impact of Natural Catastrophes			
	Event Day	Post-Event Window	Both	Total	Num. Events	Event Day	Post-Event Window	Both	Total	Num. Events	Event Day	Post-Event Window
GSCI Commodity	5	3	2	10	77	0	2	0	2	4	1	2
GSCI Gold	4	9	0	13	77	2	1	0	3	4	1	1
J.P. Morgan GGBI	9	7	4	20	77	0	0	2	2	4	1	0
FTSE Eurozone Bond Index	8	4	6	18	63	0	0	0	0	2	1	1
FTSE U.S. Gov. Bond Index	8	8	0	16	59	0	0	0	0	1	0	0

**Table 13: An event-study approach: Positive effect of terrorist attacks, financial crashes and natural catastrophes on commodity and bond**

**markets by type of impact.** The table describes the effect of terrorist events, financial crashes and natural catastrophes on commodity and bond markets. It shows the number of terrorist attacks, financial crashes and natural catastrophes that effected the performance of market indices either on the event-day or in the post-event window as well as in both periods.

Index	Terrorist Attacks				Financial Crashes				Natural Catastrophes			
	Event-Day	Post-Event	Both	Total	Num. Events	Event-Day	Post-Event	Both	Total	Num. Events	Event-Day	Post-Event
GSCI Commodity	3	4	4	1	0	0	2	1	2	2	2	2
GSCI Gold	2	2	4	5	1	1	0	1	0	1	0	1
J.P. Morgan GGBI	4	9	6	5	0	2	0	0	3	1	1	1
FTSE Eurozone Bond Index	7	7	2	8	0	0	0	1	1	0	2	2
FTSE U.S. Government Bond Index	5	3	3	5	0	0	0	0	0	0	0	0

**Table 14. An event-study approach: Positive effect of terrorist attacks, financial crashes and natural catastrophes on commodity and bond markets by strength of impact.** The table describes the effect of terrorist events, financial crashes and natural catastrophes on commodity and bond markets. It

shows the strength of the impact of these extreme events. *AR* stands for the abnormal return and *CAR* for the cumulative abnormal return. The number of stars next to *AR* and *CAR* indicates their statistical significance level: one star corresponds to 0.10, two stars to 0.05 and three stars to 0.01.

Index	Impact of Terrorist Events				Impact of Financial Crises				Impact of Natural Catastrophes			
	Event Day	Post-Event Window	Both	Total	Num. Events	Event Day	Post-Event Window	Both	Total	Num. Events	Event Day	Post-Event Window
GSCI Commodity	3	7	5	15	77	0	2	0	2	4	3	0
GSCI Gold	3	9	6	18	77	0	0	0	0	4	0	1
J.P. Morgan GGBI	2	2	2	6	77	0	0	0	0	4	2	0
FTSE Eurozone Bond Index	3	4	1	8	63	0	0	1	1	2	2	1
FTSE U.S. Gov. Bond Index	4	0	3	7	59	0	0	0	0	1	0	1
											0	9

**Table 15: An event-study approach: Negative effect of terrorist attacks, financial crashes and natural catastrophes on commodity and bond markets by type of impact.** The table describes the effect of terrorist events, financial crashes and natural catastrophes on commodity and bond markets. It shows the number of terrorist attacks, financial crashes and natural catastrophes that effected the performance of market indices either on the event-day or in the post-event window as well as in both periods.

Index	Terrorist Attacks				Financial Crashes				Natural Catastrophes			
	Event-Day	Post-Event Window	Impact	AR* AR**/**** CAR*	Event-Day	Post-Event Window	Impact	AR* AR**/**** CAR*	Event-Day	Post-Event Window	Impact	AR* AR**/**** CAR*
GSCI Commodity	3	5	9	3	0	0	0	2	0	4	0	1
GSCI Gold	2	7	1	14	0	0	0	0	0	0	1	0
J.P. Morgan GGBI	1	3	1	3	0	0	0	0	0	3	0	1
FTSE Eurozone Bond Index	1	3	3	2	0	1	1	0	2	0	1	0
FTSE U.S. Government Bond Index	5	2	0	3	0	0	0	0	0	0	1	0

**Table 16: An event-study approach: Negative effect of terrorist attacks, financial crashes and natural catastrophes on commodity and bond markets by strength of impact.** The table describes the effect of terrorist events, financial crashes and natural catastrophes on commodity and bond markets. It shows the strength of the impact of these extreme events. *AR* stands for the abnormal return and *CAR* for the cumulative abnormal return. The number of stars next to AR and CAR indicates their statistical significance level: one star corresponds to 0.10, two stars to 0.05 and three stars to 0.01.



Index	Impact of Terrorist Events				Impact of Financial Crises				Impact of Natural Catastrophes			
	Event Day	Post-Event Window	Both	Total	Num. Events	Event Day	Post-Event Window	Both	Total	Num. Events	Event Day	Post-Event Window
GSCI Commodity	8	6	0	14	77	0	1	0	1	4	2	3
GSCI Gold	3	6	3	12	77	0	1	1	2	4	2	1
J.P. Morgan GGBI	3	4	7	14	77	0	0	2	2	4	2	2
FTSE Eurozone Bond Index	13	3	0	16	62	0	1	0	1	2	2	2
FTSE U.S. Gov. Bond Index	13	0	0	13	59	0	0	0	0	1	0	0

**Table 17: A Non-parametric approach: Positive effect of terrorist attacks, financial crashes and natural catastrophes on commodity and bond**

**markets by type of impact.** The table describes the effect of terrorist events, financial crashes and natural catastrophes on commodity and bond markets. It shows the number of terrorist attacks, financial crashes and natural catastrophes that effected the performance of market indices either on the event-day or in the post-event window as well as in both periods.

Index	Terrorist Attacks				Financial Crashes				Natural Catastrophes			
	Event-Day		Post-Event		Event-Day		Post-Event		Event-Day		Post-Event	
	Impact	Abn.	Extr.	Abn.	Impact	Abn.	Extr.	Abn.	Impact	Abn.	Extr.	Impact
GSCI Commodity	1	7	4	2	0	0	0	1	1	2	2	2
GSCI Gold	3	3	5	4	0	1	0	2	0	2	1	0
J.P. Morgan GGBI	2	8	3	8	0	2	0	2	1	1	0	2
FTSE Eurozone Bond Index	6	7	3	0	0	0	0	1	1	1	1	1
FTSE U.S. Government Bond Index	8	5	0	0	0	0	0	0	0	0	0	0

**Table 18: A non-parametric approach: Positive effect of terrorist attacks, financial crashes and natural catastrophes on commodity and bond**

**markets by strength of impact.** The table describes the effect of terrorist events, financial crashes and natural catastrophes on commodity and bond markets. It shows the strength of the impact of these extreme events. *Abn.* stands for abnormal movements in the event-day returns or in the post-event window (conditional probability is in the interval  $(0.05;0.10]$ ). *Extr.* corresponds to extreme index movements (conditional probability is in the interval  $[0.00;0.05]$ ).

Index	Impact of Terrorist Events				Impact of Financial Crises				Impact of Natural Catastrophes			
	Event Day	Post-Event Window	Both	Total	Num. Events	Event Day	Post-Event Window	Both	Total	Num. Events	Event Day	Post-Event Window
GSCI Commodity	7	1	3	11	77	0	0	0	0	4	2	0
GSCI Gold	6	8	2	16	77	0	0	0	0	4	1	2
J.P. Morgan GGBI	3	5	1	9	77	0	0	0	0	4	1	0
FTSE Eurozone Bond Index	4	0	0	4	62	0	0	0	0	2	2	0
FTSE U.S. Gov. Bond Index	6	0	0	6	59	0	0	0	0	1	1	0

**Table 19: A non-parametric approach: Negative effect of terrorist attacks, financial crashes and natural catastrophes on commodity and bond**

**markets by type of impact.** The table describes the effect of terrorist events, financial crashes and natural catastrophes on commodity and bond markets. It shows the number of terrorist attacks, financial crashes and natural catastrophes that effected the performance of market indices either on the event-day or in the post-event window as well as in both periods.

Index	Terrorist Attacks				Financial Crashes				Natural Catastrophes			
	Event-Day		Post-Event		Event-Day		Post-Event		Event-Day		Post-Event	
	Impact	Abn.	Extr.	Abn.	Impact	Abn.	Extr.	Abn.	Impact	Abn.	Extr.	Impact
GSCI Commodity	3	7	1	3	0	0	0	0	2	1	0	0
GSCI Gold	2	6	4	6	0	0	0	0	1	0	0	2
J.P. Morgan GGBI	2	2	4	2	0	0	0	0	1	1	0	2
FTSE Eurozone Bond Index	1	3	0	0	0	0	0	0	1	1	0	0
FTSE U.S. Government Bond Index	5	1	0	0	0	0	0	0	1	0	0	0

**Table 20: A non-parametric approach: Negative effect of terrorist attacks, financial crashes and natural catastrophes on commodity and bond**

**markets by strength of impact.** The table describes the effect of terrorist events, financial crashes and natural catastrophes on commodity and bond markets. It shows the strength of the impact of these extreme events. *Abn.* stands for the abnormal movements in the event-day returns or in the post-event window (conditional probability is in the interval  $(0.05;0.10]$ ). *Extr.* corresponds to extreme index movements (conditional probability is in the interval  $[0.00;0.05]$ ).